

**REMARKS**

This is in response to the non-final Official Action currently outstanding with regard to the present application.

Claims 1-16 were pending in this application at the time of the issuance of the currently outstanding Official Action. By the foregoing Amendment, Claims 1-14 have been amended, and previously withdrawn Claims 15-16 have been canceled, without prejudice. No Claims have been added or withdrawn. Accordingly, upon the entry of the foregoing amendment, Claims 1-14 as hereinabove amended will constitute the Claims under active prosecution in this application.

The claims of this application as they will stand upon the entry of this Amendment are set forth above (including appropriate status identifiers) as required by the Rules.

More particularly, in the currently outstanding Official Action the Examiner has:

1. Acknowledged Applicants' Request for Continued Examination filed on 13 January 2005.
2. Acknowledged Applicants' claim for foreign priority under 35 USC §119 (a)-(d) or (f), and confirmed the receipt of the required copies of the priority documents by the United States Patent and Trademark Office;
3. Failed to reconfirm his previous indication that the drawings as originally filed with this application on 27 November 2001 are acceptable – **For the sake of the maintenance of good order in this prosecution, Applicants respectfully request reconfirmation of the acceptability of the drawings in response to this communication;**
4. Rejected Claim 1-5, 8-9, and 11-12 under 35 USC §102(b) as being anticipated by Ito (JP 2-191914);

5. Rejected Claims 1-3, 6-8, 10, and 13-14 under 35 USC §103(a) as being unpatentable over Takeda et al. ("Takeda") (U.S. Patent No. 6,724,452) in view of Ito (JP 2-191914); and
6. Indicated that Applicants' argument filed on 13 January 2005 has been fully considered but is deemed not to be persuasive as relying upon limitations disclosed in the specification by not particularly set forth in the claims.

No further comment regarding items 1-3 above is deemed to be required in these Remarks.

The Examiner's comments, summarized in item 6 above, in support of his conclusion that Applicants' previous argument is not persuasive appear to rely upon the Examiner's stated belief that Applicants have improperly attempted to read limitations from the present specification into the claims of this application. This suggests to Applicants that the Examiner realizes that the small, leftwardly slanted portions of the counter electrode shown in the Ito reference do not function in the manner of the tilted electrode surfaces contemplated by the present invention. More particularly, Applicants interpret the import of the Examiner's comments in response to their last Amendment in this application to be an indication that he feels that the present claim wording itself does not make the distinctions between the Ito reference and the present invention urged by Applicants in their previous Remarks adequately clear and definite to appropriately overcome his rejections. In view of this, Applicants by the foregoing Amendment again have amended the wording of the claims of this application.

In particular, the foregoing Amendment is respectfully submitted to more clearly, definitely and specifically claim the concepts (i) that the entire surface of one of the electrodes defining each pixel of the liquid crystal display apparatus consists of at least two portions respectively tilted in at least two different directions, and (ii) that the nature of the tilts of the respective portions of the claimed electrode are such that the slant of the liquid crystal molecules throughout the entire thickness of the liquid crystal layer of the pixel between the respective tilted surface portions of that electrode and the opposing electrode is determined by the tilted electrode sections when the applied voltage is between zero and the predetermined maximum necessary to turn those molecules to their parallel orientation to the surfaces of the substrates. In this regard, it is to be noted that Applicants now have made it clear that the surface of the electrodes defining tilted electrode surfaces consists of surfaces that are adjacent to one another and respectively face in directions different from a direction substantially perpendicular to the substrate surfaces thereby removing any ambiguity regarding whether or not the entirety of the electrode surface is claimed to be tilted as claimed.

The newly cited Takeda reference (referred to in item 5 above), on the other hand, is directed to electrodes that define projections from otherwise flat electrode surfaces, not surfaces that are tilted over the entirety of the surface area of the electrode. The Takeda concept, therefore, includes generally centralized projections extending from an otherwise flat electrode surface (as discussed previously with respect to the Takeda publication not currently relied upon by the Examiner) as well as the alternative of one or more ridges extending outwardly from a flat electrode surface (permissibly separated not only by flat electrode portions but also by slots in the flat electrode). Accordingly, while the Takeda patent relied upon by the Examiner in the currently outstanding Official Action might be characterized as showing tilted electrode portions somewhat more broadly than the previously cited central projections from a flat electrode surface as shown in the previously cited Takeda publication (note the ridges extending outwardly from the electrode surface in a substantially "V"-shaped configuration defining four differently tilted electrode surfaces extending outwardly from an otherwise flat electrode surface), Applicants respectfully submit that the Examiner's rejections based upon the newly cited extensive Takeda reference patent still are insufficient to teach, disclose or suggest the present invention.

More particularly, Applicants respectfully submit that once the claims of the present application are clarified as set forth hereinabove, it becomes unequivocally clear that in the present invention the entire surface of one of the electrodes defining each pixel consists of at least two portions tilted in different directions from one another so as to achieve the "regular regulation" of the liquid crystal molecules between each tilted section and the opposing electrode of the pixel as discussed in Applicants' previous submissions in this prosecution. In other words, a central projection or a plurality of spaced ridges projecting from a flat electrode surface is not the same as the present invention wherein the entire surface area of at least one of the electrodes defining each pixel is tilted in at least two different directions.

Further, as previously argued in this prosecution, Applicants respectfully submit that the Examiner's rejections based on alleged anticipation by the Ito reference are based upon the fact that the counter electrode 35 shown in the drawings of the Ito reference has tilted "surfaces" in two directions. As mentioned above and presently clarified in the claims of this application, however, in the present invention the liquid crystal molecules are disposed substantially perpendicular to the substrate surfaces in the absence of applied voltage and substantially parallel to the substrate surfaces in the presence of an applied predetermined voltage. Hence, in the present invention when a potential between zero and the predetermined potential value is applied across the liquid crystal layer, the slant orientations of the molecules of the liquid crystal material are regularly regulated all the way across the gap between the electrodes in at least two predetermined directions by virtue of the tilted surfaces of the electrodes as now herein claimed (see, for example, Figure 3 of the present application).

The Ito reference is different. The purpose in Ito is to uniformly obtain a result of a tilt orientation (presumably of the liquid crystal molecules) approximating that of a conventional homeotropic (perpendicular to the substrate) orientation thereof by the provision of electrodes inclined relative to the substrate surface.

More particularly, Applicants respectfully submit that contrary to the Examiner's present construction of the disclosure of the Ito reference, the Ito reference in fact discloses the use of slanted electrodes wherein there is a single predominant direction of the electric field between the electrodes and the counter electrode. More specifically, Applicants respectfully submit that, as alluded to in its English language Abstract, the Ito reference utilizes the concept of a slanted electric field between the electrode and counter electrode to obtain a substantially uniform homeotropic orientation of the liquid crystal molecules. Therefore, in the Ito reference, the electric field between the electrode and the counter electrode is slanted by an angle 38 to the horizontal so as to overcome the prior art tendency of the liquid crystal molecules to tilt (as shown at the angle 41 in Ito's Fig. 3). That is to say that the angle 38 to the horizontal of the Ito electrodes creates an electric field between that electrode and the associated counter electrode that slants at an angle equal to the angle 41 to the left of the vertical as shown in Fig. 3 of Ito so as to pull the liquid crystal molecule orientation to the desired substantially homeotropic orientation.

In other words, Applicants respectfully submit that Ito actually teaches that the effects present in a non-compensated case (such as that shown in his Fig. 3), prevent the liquid crystal molecules from aligning themselves normally to the substrate surfaces under conditions of zero applied voltage whether those surfaces are covered with an overlayer or not (see angle 41 in Ito's Fig. 3). To correct for this residual molecule slant, the Ito reference creates a configuration of slanted pixel defining electrodes that is primarily (substantially totally) slanted in a single direction, i.e., wherein the pixels essentially are defined between the rightwardly, downwardly slanted upper and lower electrodes 35 as shown in his Figs. 1 and 2; and wherein the angle of downward slant is (based upon a rough measurement of the drawings) equal to the angle by which the liquid crystal molecules fail to align with a normal to the surfaces of the substrates under conditions of zero applied voltage.

Accordingly, Applicants respectfully submit that the Ito reference teaches, discloses and/or suggests to one skilled in the art that the basic configuration of the structure of his Fig. 1 cannot result in the liquid crystal molecules being aligned normally to the surfaces of the substrates under conditions of zero applied voltage. Further, Fig. 2 of the Ito reference teaches, discloses and/or suggests to one of ordinary skill in the art that a compensation plate having its smallest principal index of refraction disposed substantially parallel to the normal to the substrate surface is required to compensate for a remaining birefringence experienced by light rays attempting to pass through his device parallel to the normal to the substrate surfaces, and that this is the case even when Ito utilizes his slanted electrode configuration.

The result of the foregoing is that a good white display, essentially equivalent to that expected from a perfect homeotropic molecule orientation, can be achieved utilizing the Ito slanted electrode configuration along with a compensation plate and burying the electrodes in insulating film layers. In any case, however, Applicants respectfully submit that the small leftwardly tilted portions of the upper counter-electrode 35 depicted in the Ito reference clearly do not function in the manner of the sections of the electrodes of this invention (i.e., the effect of those short portions is very localized, and does not “regularly regulate” the disposition of the liquid crystal molecules all the way across the liquid crystal layer disposed between the electrodes as in the present invention). Applicants respectfully submit that the clarification phraseology added to the claims by the foregoing Amendment fully, clearly and distinctly claims these facts without in any way attempting to read limitations from the specification into the claims as the Examiner indicated that he believed Applicants’ previous Amendment attempted to do.

In summary, therefore, Applicants now propose that Claim 1 be amended so as to clearly reflect the foregoing distinctions between the present invention and the Ito reference. Further, Applicants respectfully submit that as so amended Claim 1 (as well as the claims that depend therefrom) cannot be interpreted in a manner such that the Ito reference would anticipate them. The reason for the difference is clear. In the present invention, the electrode/counter electrode configuration is always such that the different volumes of liquid crystal material between the respective tilted surfaces of the electrode and the counter electrode contain essentially distinct and uniformly directed electrical fields and associated lines of electrical force. Hence, the molecules slant differently in one “domain” associated with one tilted surface of the claimed electrode relative to the molecules in another “domain” associated with that electrode.

In the Ito reference, on the other hand, the directions of tilt of all of the surfaces of the various individual "pixel-defining" electrode surfaces are effectively the same. Further, the counter electrode is configured such that it defines sections of close to the same size, shape and tilt angle as the opposite individual pixel-defining electrodes respectively, and those sections are essentially aligned with the individual electrodes. The counter electrode, however, has the inwardmost edge of each of its major tilted sections connected to the outwardmost edge of the next adjacent major tilted section by a differently tilted connection portion. Applicants respectfully submit, however, that the fact of the matter is that when a potential is applied across the liquid crystal material, the lines of electrical force between the counter electrode and the individual electrodes (with the minor exception of small volumes adjacent to the connection portions that do not extend all the way through the liquid crystal layer) extend between the electrodes and the counter electrode at the angle shown at reference numeral 41 in Figure 3 of the Ito reference. In other words, there is a predominant (essentially single) direction of effect upon the electric field between the individual electrodes and the counter electrode introduced by the tilt angles thereof in the Ito reference. Consequently, Applicants respectfully submit that the Ito et al reference is conceptually and structurally inapposite to the domain concept taught by the present invention.

The presence of the small connecting portions between the large (principal) tilted portions of the counter electrode 35 in the Ito reference, therefore, is respectfully submitted to be minimal and localized at best. They portions of the counter electrode certainly do not function in any way to create multiple domains between differently tilted principal portions of the electrodes between which the liquid crystal material is located in each pixel. Rather, the connector sections of the counterelectrode merely serve as a convenience that incidentally also serves in conjunction with the spaces between the slanted opposing electrodes to separate the pixels defined between the longer counter electrode sections and the opposing separate electrodes.

As alluded to briefly above, Applicants previously believed that the use of phraseology indicating that the slant of the liquid crystal molecules is "regularly regulated" according to the tilted orientations of the respective portions of the tilted surface electrodes was sufficient in the latter regard. The reason for this was that the small slanted electrode portion disclosed by the Ito reference is manifestly and obviously to one skilled in the art inadequate to control the slant of the liquid crystal molecules throughout the thickness of the liquid crystal layer under conditions of applied voltage between zero and the predetermined maximum voltage. Since the Examiner disagreed with this position, Applicants by the foregoing Amendment have now made this important point of distinction abundantly and totally clear by the foregoing new claim phraseology.

Consequently, in view of the foregoing Amendment and Remarks, Applicants respectfully submit that the Examiner's suggestion that Applicants in their previous Amendment in this application were attempting to read limitations into the claims of this application from the specification now has been overcome. Accordingly, Applicants respectfully request reconsideration and allowance of this application as hereinabove amended in response to this communication.



Applicant also believes that additional fees beyond those submitted herewith are not required in connection with the consideration of this response to the currently outstanding Official Action. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge and/or credit Deposit Account No. 04-1105, as necessary, for the correct payment of all fees which may be due in connection with the filing and consideration of this communication.

Respectfully submitted,

Date: July 6, 2005

David A. Tucker  
SIGNATURE OF PRACTITIONER

Reg. No.: 27,840

David A. Tucker  
(type or print name of practitioner)  
Attorney for Applicant(s)

Tel. No. (617) 517-5508

Edwards & Angell, LLP  
P.O. Box 55874  
P.O. Address

Customer No.: 21874

Boston, MA 02205